FRIENDSVIEW RCF PHASE 1
Exhibit H: Preliminary Sewer Evaluation Memo

December 17, 2020

City of Newberg - Engineering
414 E. First Street
Newberg, OR 97132

RE: Friendsview RCF - Sanitary Sewer Analysis

City Engineering Staff:

The purpose of this letter is to provide documentation and analysis of the existing and future wastewater flows from the development and the capacity of the existing downstream system as required per City of Newberg Pre-Application Meeting Notes dated May 27, 2019. This analysis is to show that the existing public sanitary sewer has capacity to support the development of Friendsview RCF Phase 1. The study includes the existing public sanitary sewer main directly downstream of the project site.

Existing Sanitary

The existing property is currently served by an 8" lateral that is connected to a manhole with a 10" public sewer main exiting at 1.00%. The 10" main runs parallel to Hess Creek where it progressively gets larger before making its way to the wastewater treatment plant. According to the City of Newberg's Wastewater Master Plan (WWMP) completed in May of 2018 there are no immediate deficiencies downstream of the subject site. The WWMP does indicate deficiencies closer to the wastewater treatment plant, however, upgrading this main line is at the top of the City's priority list and multiple alternatives were presented in the report.

Proposed/Existing Sanitary Flows

Sanitary flows for the basin were derived using the City of Newberg Wastewater Master Plan as well as the City's Zoning map. The City's zoning map as well as the utility GIS map was used to delineate a basin similar to FM Basin 1 shown in Figure 9. The basin was then delineated by zone and Table 4-2 was used to calculate the total dry weather flow. Inflow and infiltration were assumed to be approximately 1,000 gallons per acre per day and a peaking factor of 1.3 as stated on page 2-6 of the WWMP. The estimated total peak flow generated by the entire basin, including future developments shown on the attached Flow Calculation, is equal to approximately 1.00 cfs. As such, these improvements should not cause any immediate capacity deficiencies in the downstream sanitary sewer system.

Should you have any questions, do not hesitate to contact me at 503.563.6151 or by email at chuckg@aks-eng.com.
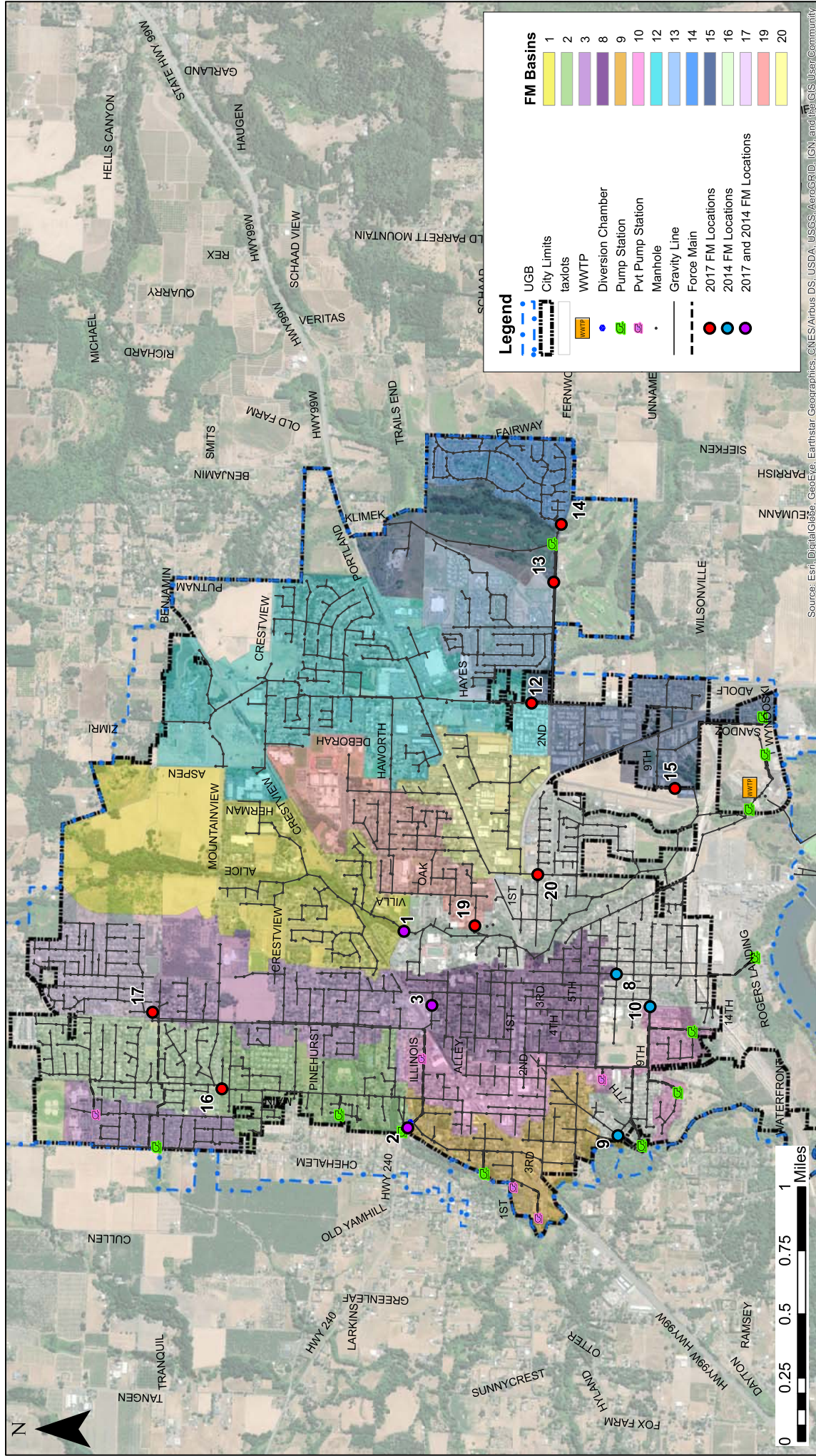
Sincerely,
AKS ENGINEERING & FORESTRY, LLC

Chuck Gregory, PE – Associate

Attachments:

- WWMP Figure 9 & Table 4-2
- WWMP Pages 2-5 & 2-6
- Newberg Zoning Map
- Flow Calculations

RENEWS: JUNE 30, 20 21

Flow Monitoring Locations

Wastewater Master Plan

Figure 9

City of Newberg, OR
May 2018

Legend

- UGB
- City Limits
- taxlots
- WWTP
- Diversion Chamber
- Pump Station
- Pvt Pump Station
- Manhole
- Gravity Line
- Force Main
- 2017 FM Locations
- 2014 FM Locations
- 2017 and 2014 FM Locations

FM Basins
1
2
3
8
9
10
12
13
14
15
16
17
19
20

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

KELLER ASSOCIATES

City of Newberg OREGON

Modeled gravity main slopes were compared with these recommended minimum slopes. The mains that are less than their recommended minimum slope are shown in Figure 11 (Appendix A). Pipes with inverse slopes are highlight in this figure as well. Low or inverse slopes can cause capacity issues and require higher than normal O&M. These mains should be monitored for capacity, odor, and solids buildup problems. All pipes in the collection system should be on a regular maintenance schedule. Pipes with low slopes may need to be cleaned more frequently to prevent solids buildup and flow disruption.

4.2   FUTURE COLLECTION SYSTEM PERFORMANCE

This section summarizes future flow projections and the model evaluation of future system expansion, and documents anticipated future deficiencies. Alternative improvements to address these deficiencies are presented in Section 5.

4.2.1   Future Flow Projections & Model Scenarios

Future loads were distributed based on PSU population projections (Section 2) and City projected future residential, commercial, and industrial growth. Flows per capita for projected population growth were assumed to be similar to existing flows per capita. Residential flows were projected using future growth area, average lot size, population density, and ADWF per capita attributed with residential contributions. Commercial, industrial, and institutional flows were projected using future growth areas indicated by City planning staff and typical flow per acre values (Metcalf and Eddie, 3rd Edition). Projected flows per zoning designation for the 20-year planning period are presented in Table 4-2. Projected flows per zoning designation for buildout are presented in Table 4-3.

Table 4-2: 20-Year Projected Flows by Zoning

Zoning	Average Lot Size[A] (ac)	Pop. Density[A, B] (people/ac)	Flow[C] (gpad)	Future Growth Area[A] (ac)	Flow[D] (gpd)
R-1	0.227	12	880	388	334,500
R-2	0.111	24	1,801	99	213,800
R-3, R-4	0.061	44	3,301	37	131,700
M-1, M-2, M-3	N/A	N/A	1,250	109	135,700
C-1, C-2, C-3	N/A	N/A	1,250	61	76,700
I	N/A	N/A	2,000	56	113,000
Infill	N/A	N/A	N/A	N/A	40,100
			Totals:	751	1,046,000

[A]Allocates 25% of area for roads and other public dedication, except on industrial and commercial zones, where 20% is allocated.
[B]Assume 2.69 people/dwelling unit (2010 US Census).
[C]Residential flows based on design ADWF per capita value of 99 gpcd (Table 2-5) then reduced by 25% accounting for removal of the industrial, commercial and institutional flows that contribute to the derivation of the 99 gpcd value. Industrial, commercial, and institutional flows based on typical flow per acre values (Metcalf and Eddie, 3rd Edition).
[D]Utilizes average annual dry-weather flows.

Table 2-3 below). The DEQ method was used as the design value since it estimates a higher $PDAF_5$ than the top five flow events and was felt to be representative of the higher 5-year design rainfall event.

Table 2-3: Top Five Flow Events

Date	Flow (MGD)	Rain (in/day)
December 7, 2015	20.96	2.16
December 8, 2015	19.98	1.11
December 17, 2015	19.81	2.41
January 19, 2012	17.61	1.74
December 9, 2015	15.65	0.50

Peak Instantaneous Flow (PIF_5)

The peak instantaneous flow (PIF_5) represents the peak instantaneous flow (or peak hourly flow) associated with the $PDAF_5$. In the absence of hourly flow data, DEQ recommends obtaining the PIF_5 by extrapolation from their own chart titled Graph #3. $PDAF_5$, $MMWWF_5$, $PWkF$, and $AADF$ are graphed (on specific log-probability scale) versus their probability of occurrence (Chart 2-3). A best-fit line between these known points is drawn.   The PIF_5 is located where that best-fit line crosses the 0.011% probability.

Chart 2-3: DEQ Graph #3
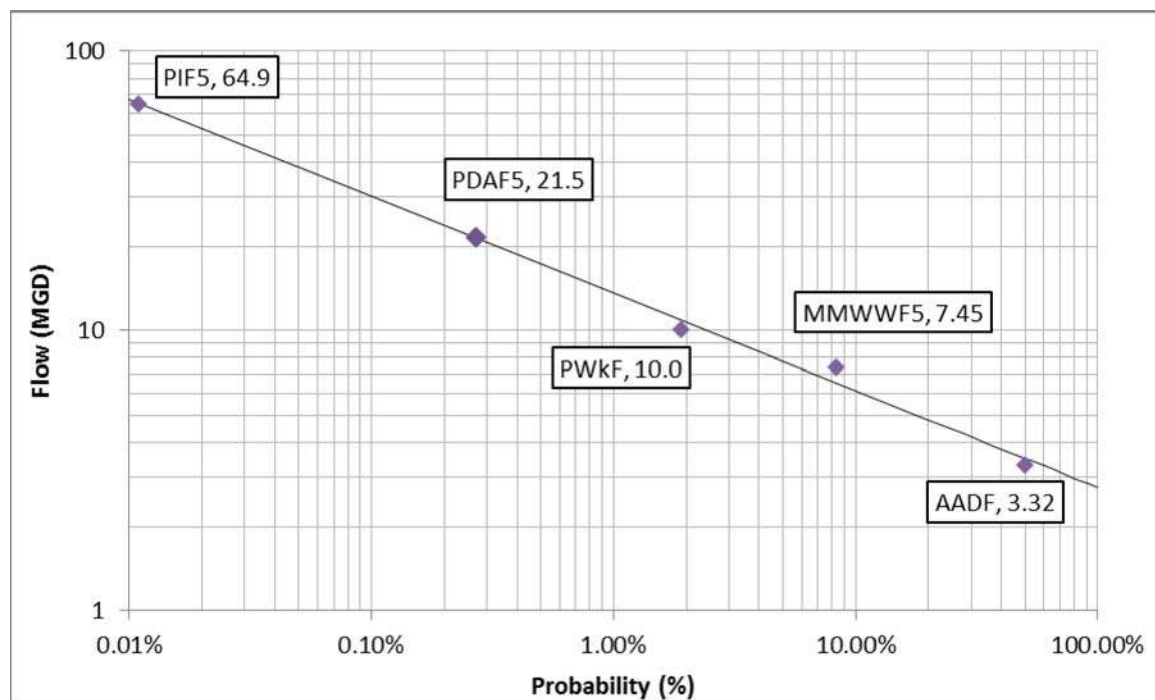
The City has SCADA records, which provide continuous flow data that can be compared against the PIF_5 produced by the DEQ method. The DEQ PIF_5 represents a peaking factor of approximately 3, with respect to a $PDAF_5$ of 22.1 MGD (which is very large

even for peak flows so heavily influenced by I/I). When groundwater is very high after a large storm event, the effect of I/I is more or less constant, which dampens the peaking that occurs. A peaking factor of approximately 1.3 was observed in the City's SCADA data for previous peak events (see Appendix B) and was used to estimate a more realistic PIF_5 of 28.7 MGD.

Infiltration and Inflow (I/I)

I/I is an issue in the collection system and results in high peak flows experienced at the WWTP during wet weather. The City has been working to characterize and evaluate I/I throughout the system. I/I work completed previously and for this master plan is discussed in Section 7. The City's ongoing efforts to reduce I/I in its system will affect flows at the treatment plant.

Observed Historical Flows and Projected Design Flows

Observed flows for each year from 2012–2015 were developed for comparison with projected flows, and are summarized in Table 2-4 below. Observed historical flows were derived as described in the preceding paragraphs, with the exception of $PDAF_5$ and PIF_5. The $PDAF_5$ for historical flows is the observed maximum from the corresponding year; the peaking factor of 1.3 was used to convert $PDAF_5$ to PIF_5.

Table 2-4: Observed Historical Flows

	Historical Flows (MGD)				Design Flow (MGD)
Year	2012	2013	2014	2015	2015
Population	22,300	22,580	22,765	22,900	22,900
ADWF	2.25	2.51	2.19	2.14	**2.27**
$MMDWF_{10}$	2.96	3.63	2.93	2.30	**4.48**
AADF	3.78	2.69	3.27	3.54	**3.32**
AWWF	5.33	2.88	4.36	4.96	**4.38**
$MMWWF_5$	7.26	3.63	6.68	9.66	**9.66**
PWkF	10.8	6.02	8.73	14.5	**10.0**
$PDAF_5$	17.6	9.5	13.6	21.0	**21.5**
PIF_5	22.9	12.4	17.6	27.3	**28.0**
Total Rainfall (in/yr)	47	25	39	40	-

To project the design flows derived from the analysis described in preceding paragraphs, a projected flow per capita (reported in gallons per capita per day, gpcd) was developed. This projected per capita flow is the same as the design unit flow for ADWF, $MMDWF_{10}$, AADF, and AWWF, but was scaled down for $MMWWF_5$, PWkF, $PDAF_5$, and PIF_5. Projected design flows (MGD) are based on 2015 design flows with the addition of the product of projected unit flows (gpcd) and projected population increase. This method recognizes the existing effects of I/I on flow, but projects a reduced I/I influence on wet-weather flows in future, more watertight, developments that employ better construction
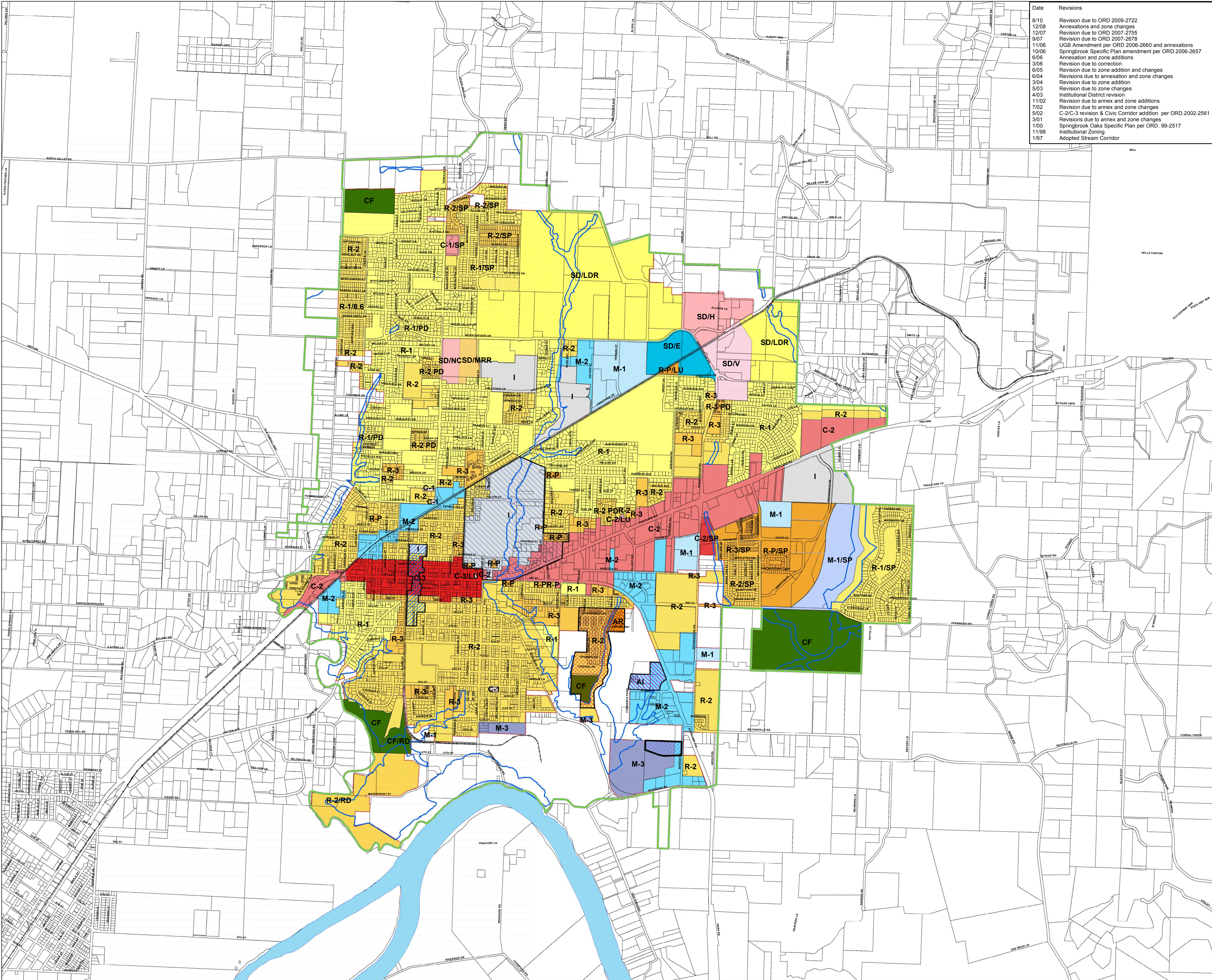
Date	Revisions
8/10	Revision due to ORD 2009-2722
12/08	Annexations and zone changes
12/07	Revision due to ORD 2007-2755
9/07	Revision due to ORD 2007-2678
11/06	UGB Amendment per ORD 2006-2660 and annexations
10/06	Springbrook Specific Plan amendment per ORD.2006-2657
6/06	Annexation and zone additions
3/06	Revision due to correction
6/05	Revision due to zone addition and changes
6/04	Revisions due to annexation and zone changes
3/04	Revision due to zone addition
5/03	Revision due to zone changes
4/03	Institutional District revision
11/02	Revision due to annex and zone additions
7/02	Revision due to annex and zone changes
5/02	C-2/C-3 revision & Civic Corridor addition per ORD.2002-2561
3/01	Revisions due to annex and zone changes
1/00	Springbrook Oaks Specific Plan per ORD. 99-2517
11/98	Institutional Zoning
1/97	Adopted Stream Corridor

City of Newberg, Oregon

**NEWBERG
ZONING MAP**

**Including the Urban
Growth Boundary**

Interim Industrial Use Overlay
Airport Industrial Overlay
Airport Residential Overlay
Institutional Overlay
Civic Corridor Overlay
Urban Growth Boundary
Stream Corridor
City Limits

Zones
ZONING

C-1 Neighborhood Commercial
SD/V Springbrook District - Village
SD/NC Springbrook District - Neighborhood Commercial
SD/H Springbrook District - Hospitality
C-1/SP Specific Plan
C-2 Community Commercial
C-2/LU Community Commercial/Limited Use
C-2 PD Planned Unit Development
C-2/SP Specific Plan
C-3 Central Business District
C-3/LU Central Business District - Limited Use
CF Community Facility
CF/RD Community Facility Riverfront District
I Institutional
M-1 Limited Industrial District
M-1/SP Specific Plan
AI Airport Industrial
M-2 Light Industrial District
SDE Springbrook District - Employment
M-3 Heavy Industrial District
R-1 Low Density Residential
SD/LDR Springbrook District - Low Density Residential
R-1/PD Planned Unit Development
R-1/0.1 Low Density 0.1 d.u./ac.
R-1/0.4 Low Density 0.4 d.u./ac.
R-1/6.6 Low Density 6.6 d.u./ac.
R-1/SP Specific Plan
R-2 Medium Density Residential
R-2 PD Planned Unit Development
R-2/RD Riverfront District
R-2/SP Specific Plan
SD/MRR Springbrook District - Mid-Rise Residential
R-3 High Density Residential
R-3 PD Planned Unit Development
R-3/SP Specific Plan
R-P Residential Professional
R-P/SP Specific Plan
R-P/LU Residential Profession - Limited Use
AR Airport Residential

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NO WARRANTY AS TO THE MERCHANTABILITY OR
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This map is created from various data sources and is
subject to change without notice. This map is intended
for general planning purposes only.

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City of Newberg
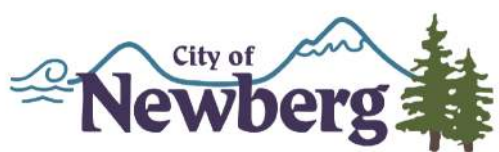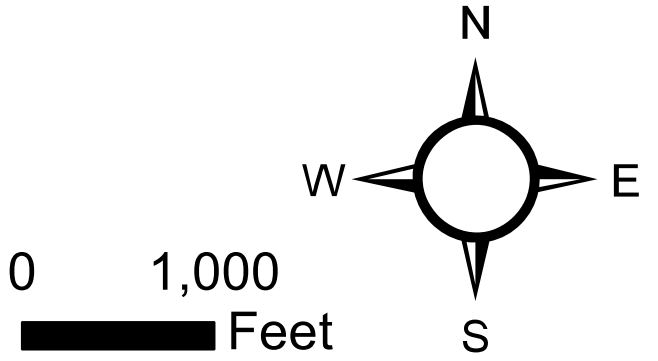
Map created by Jan Wolf
Public Works Department - Engineering

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*The most current edition of this map
can be found at www.newbergoregon.gov*

Channel Report

Friendsview

Circular

Diameter (ft)	= 0.83
Invert Elev (ft)	= 135.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.00

Highlighted

Depth (ft)	= 0.63
Q (cfs)	= 2.000
Area (sqft)	= 0.44
Velocity (ft/s)	= 4.53
Wetted Perim (ft)	= 1.76
Crit Depth, Yc (ft)	= 0.64
Top Width (ft)	= 0.71
EGL (ft)	= 0.95

Elev (ft)

Section

Reach (ft)